XA0200075 IAEA-SM-367/8/06

ALTERNATIVES TO REACH SAFEGUARDS GOALS AT ATUCHA I NUCLEAR POWER PLANT

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This Paper describes the main features of Atucha I Nuclear Power Plant and the current safeguards' approach applied to this installation by the International Atomic Energy Agency (IAEA) and the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC). The reasons for not completely fulfilling the IAEA safeguards criteria with the current approach are also described and a conceptual proposal of an unattended system developed jointly by ABACC and the Nuclear Regulatory Authority of Argentina (ARN) is presented. Finally, the paper addresses an alternative proposal to the previous one aiming at fulfilling the above mentioned objectives.

Atucha I Nuclear Power Plant (NPP) was built in the 70's and has been under operation since 1974. This is an On Load Reactor, moderated and refrigerated with heavy water (PHWR). From its starting up to about a year ago, this NPP operated with natural uranium fuel assemblies but presently the reactor core is fed with slightly enriched uranium fuel assemblies (0,85 %). This Plant generates up to 357 Mwe. An outstanding operating characteristic of this power reactor is that low burn-up fuels assemblies already discharged into the pond may be re-used when necessary upon neutron flux requirements (re-shuffling). This installation has a pond storage capacity of about 10,000 fuel assemblies. At the highest power rate, the reactor core must be fed with a frequency of about 0,72 fuel assemblies per day.

Before the application of the Agency Safeguards Criteria (IAEA-SC) in (1991), AtuchaI had always satisfied the IAEA safeguards goals. Since 1991 the IAEA-SC demanded for On Load Reactors the control of the flow of irradiated fuel assemblies that leave or enter into the core (re-shuffling).By that time, Atucha I had been working for about seventeen years and there was no possibilities to install specific safeguards equipment without making significant construction modifications on this installation. Under the framework of a preliminary conceptual idea, based on construction modification constraints, stated by ARN; ABACC and ARN assumed the responsibility to elaborate a joint development on this issue.

Based on the experience gained by the Nuclear Regulatory Authority in the design of an unattended system and ABACC's safeguards experience in making requirements for such system, it was jointly developed the conceptual design of a monitoring system for the transfer of irradiated fuel at Atucha I. This paper describes the conceptual design of the unattended system above mentioned, that in ABACC and ARN opinion satisfies the IAEA-SC. The conceptual proposal is already under IAEA consideration.

The Atucha I fuel assemblies are approximately six meters long and there are only four possible paths through which the spent fuel elements may pass to or from the reactor building. Two of them are two circular entrances used for big components that are adequately welded. The other two paths are the transfer's channel and the hole flanged. The first one is directly connected to the pool and all components and tools to the reactor core are passed through it. The second one is generally used for introducing tools and no-irradiated channels into the reactor building.

The proposal consists of an unattended system, which is composed by gross gamma counting detectors and underwater surveillance cameras at the storage pond area The two sets of gamma detectors will measure any gamma emission coming from any object of significant energy that enters or leaves the pond through the transfer channel. One set of detectors will be located as close as possible to the transfer tube exit and the other set will be placed downstream at a distance of about three quarters of the length of a fuel assembly. The surveillance, that consists of underwater cameras will record all the movements through the channel into and out the bay. The cameras deters from any attempts to tamper the detectors with small shields and, of course, will also record events such as the presence of a shielded flask or the transfer of irradiated tools.

In addition to the proposed containment and surveillance system briefly described above, ARN and ABACC are considering an alternative safeguard scheme to achieve IAEA safeguards goals based on unannounced inspections. The paper also describes this approach and presents a summary of advantages an disadvantages obtained from the comparison of the two alternatives.